ESTABLISHING SCIENTOMETRIC DATABASE FOR HARNESSING EXPERTISE AND INFORMATION SOURCES

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INTRODUCTION : Amidst ignorance and poverty in many developing countries, advanced scientific institutions also exist. Fortunately, today India has very good infrastructure for research and development activities shared by Central Government and State Governments through I.C.A.R., C.S.I.R., U.G.C., I.I.T's, Surveys, Universities, Research Laboratories, National Bureaux, National Research Centres and All India Co-ordinated Research Projects etc. All have done considerable progress to achieve their mandates/objectives. But database facilities are not yet available to link all through inter-disciplinary and multi-disciplinary approaches into functional network system so as to enable contacts with isolated researchers, in order to avoid investments in duplication of research efforts, to reach farmers and industries as soon as the information is generated, and to influence developmental agencies for acting on recommendations etc. Moreover, as budgets for research are being restrained, a better allocation of the existing resources is necessary. By comparing research priority areas with existing scientific expertise, the segments of research in which both converge and those in which gap exist can be identified and the appropriate measures can be applied in order to correct divergences and harness convergences.

FACILITIES : International databases that can be usefully tapped are : 1. Bio-science Information Service (BIOSIS) from United States which publishes Biological Abstracts and BIo-research Index, 2. Bibliography of Agriculture which is a monthly USDA documentation service (AGRICOLA), 3. Abstracts of Commonwealth Agricultural Bureaux (CAB) which publishes abstracting journals, 4. The International Information System for the Agricultural Sciences and Technology (AGRIS) by FAO where India is also a contributor through Agricultural Research Information Center, 5. PUDOC (Centre for Agricultural Publishing and Documentation of the Netherlands, Wangeningen), 6. IRRI (International Rice Research Institute, Philippines), 7. CIMMYT (Centro International de Mojoromiento de Meiz Y Trigo, Mexico), 8. IITA (International Institute of Tropical Agriculture, Ibadan, Nigeria), 9. CIP (International Potato Centre, Peru), 10. CIAT (Centreo International de Agricultural Tropical, Columbia), 11. ILCA (International Livestock Centre for Africa), 12. INIS (International Nuclear Information System), and 13. ICRISAT etc.

Coverage made by these on Indian research is not known precisely and certainly full coverage is not given. Even in INSDOC's Indian Science

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Abstracts the Indian Agricultural Literature is not comprehensive. There are many other agencies and institutions in India which bring out secondary information through abstracting to facilitate their own employees, students or clients as selective dissemination of information service.

Agricultural Science is an applied field, and as such it is frequently suggested that work in it would be of local relevance only. Hence, Central facility to link all of the information generating centres in a network is essential and NAARM can play active role to establish the system.

CONSTRAINTS : Although India has the third largest scientific community(1) it ranked eighth, in 1977 in the number of scientists involved in publication(2), which indicated certain constraints in the implementation of research. The extension services now used for transfer of information(3) particularly in agriculture, small industry and health sectors, are working independently of each other as well as of the national information system. As a result there is on the one hand duplication of effort and on the other inadequate and inefficient use of the available resources.

A bottleneck to software development is the shortage of skilled manpower. A long term perspective and multi-disciplinary approach involving sophisticated analytical tools and techniques on the one hand and a broad perspective of social, historical and cultural dimensions of science on the other are required. Agricultural research is increasingly fragmented along disciplinary lines. As such discipline develops a somewhat different vocabulary, cross-disciplinary communication gets restricted. Already available information is not used (wastage) due to social constraints like low literacy, limited media access and availability, low computer literacy, low levels of education and unsound communication policies(4).

METHODOLOGY : The data bank(5) is intended : 1. to provide standardized institutional bibliographies, 2. to enable multipurpose on-line/off-line searches, 3. to serve as a reference source for the computerized building of scientometric indicators and 4. to supply data to science policy makers, research managers, and researchers.

Scientometric assessments(6) refers to the publication productivity of research communities such as: 1. research groups, university departments, 2. research institutes, 3. learned societies, 4. countries, geological regions, and 5. science fields or sub-fields.

If scientometric indicators are to be used for comparative/evaluative purpose, 1. extract data from common source, 2. select proper reference standards, and 3. complement indicators by statistical reliability estimates.

Impact factor(7,8) is a measure of the frequency with which the average cited article in a journal has been cited in a particular year. The Science Citation Index data base classifies journal papers into the following types: 1. Articles, reports, technical papers, etc., 2. Reviews and bibliographies, 3. Letters, communications etc., 4. Technical notes, 5. Meeting abstracts, 6. Discussions, conference items, 7. Items about individual (tributes, obituries, etc.) 8. Editorials, 9. Corrections, errata etc. and 10. Mail address of authors.

Scientific prestige and capability of India will go up(9) if all Institutions are subjected to following fifteen tests: 1. Attendance at Board meetings and implementation of Board decisions, 2. Were research students registered in adequate number and given proper guidance by their supervisors?, 3. Is the faculty carrying out any new research programmes individually or in teams and publishing its research output in journals, books, etc. ?, 4. Were additional funds procured for the Institute and financial conditions stabilised ?, 5. Were annual reports submitted in time ?, 6. Were the turn-over problems of the faculty handled promptly through regular placements ?, 7. Were the funds allotted utilised fully for specified purposes ? 8. Did the Institute win any external recognition, research contracts, invitation for academic participation, etc. ?, 9. Were any arrange ments with other distinguished institutes and joint research programmes worked out ?, 10. Did the institutes status in the peer academic world go up ?, 11. Was young talent attracted to the Institute in sufficient measure and whether such talent was able to work with enthusiasm and zeal ?, 12. Did external visitors and subject experts came to the institute and arrange seminars and faculty discussions ?, 13. Did the Institute enhance its public image by successfully organising national and international conferences, workshops, etc., 14. How many of the faculty members came to be deemed as professional subject specialists and experts by international standards ? and 15. Has the Director adequate research or Scientific work during his tenures ?

Performance Indicator Matrix (PIM) for scientific research for past activities(10) can be developed with following quantitative activity parameters vs departments or disciplines or domains under consideration: a. the communication behaviour: papers, articles, citation index, reports, invited speaker, b. guests scientists in the laboratory or institute, c. number of Ph.D. degrees/n year, d. number of Ph.D. degree/researchers, e. number of postgraduate students, f. number of national and international awards, g. patents, h. industrial contacts, i. ratio internal/external funding, j. ration external money/FTE researchers (FTE = full time equivalent) k. age structure of the research group, l. membership of scientific committees, m. scholarships, fellowships, n. medium and long term visits to other laboratories.

Quinquennial review teams or referees can follow all above mentioned parameters in addition to local specific criteria for the domain if any. The construction of these matrices can be done ad hoc, based on the available elements. It allows to classify a case in its scientific environment on the basis of its performance. It avoids the problem of giving weights to the various parameters. A grading of a case through confrontation with several parameters allows for a good and objective judgement of the performance, even between disciplines.

The judgement of qualitative elements depends much or the intuition and knowledge of the experienced refree. An analytical synopsis of the scoring rate of the different relevant aspects of the dossier in the form of a graph promotes the objectivity through Research Proposal Profile (RPP). It also allows the applicant to obtain insight into the criticism of his application(10) : 1. definition of the objectives, finality of the research, 2. relation to the state of the art, 3. motivation (the why) for the research, 4. methodology, work hypothesis and planning, 5. existing infrastructure, 6. budget, 7. feasibility, 8. originality, and 9. impact on existing knowledge.

For these nine elements a five-level appreciation ranging from 1 to 5 should be given: 1 - outstanding, 2 - extremely good, 3 - good, 4 - sufficient and 5 - insufficient.

Evaluation of research proposals and future projects will depend on the subjective/qualitative criteria such as originality and feasibility, and the quantitative analysis will serve as a background. An equilibrium between information of past research and on prospects is necessary. A similar system, with two or three referees, can very easily be developed for scientific journals also. Bibliometric data provide a "monitoring device" for science policy and research management. They can also be used to explore large scale collaboration and team work, in specific domains.

WORKSHOP : Simple and easy to follow formats will be discussed by taking example of one of the ICAR Institutes as case study.

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Dossier Date

PROFILE

	A	B	C	D	E
1 Finality					
2. Status of research					
3 Motivation					
4. Methodology/Plan of work					
5. Existing infrastructure					
6. Needs					
7 Feasability					
8. Originality					
9. Impact					

Quality profile of scientific project by referee peer commission.
A excellent; B very good; C good; D sufficient; E insufficient.

	P_{ij}	P_{i1}	P_{i2}	P_{i3}	•	P_{in}
	P_{1j}	f_{11}	f_{12}	•	•	f_{1n}
	P_{2j}					
	P_{3j}					
	•					
i	P_{mj}	f_{m1}	•			f_{nm}

Performance Indicator Matrix for scientific research. Columns : disciplines; rows : quantified activities such as publications (subdivided), participation of meetings, presentations, memberships, ...

f_{ij} : average frequency of a specific activity i for a specific discipline j.